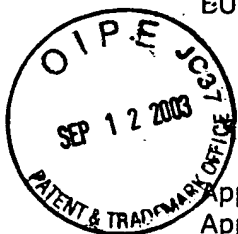


BU9-97-226

PATENT

#33  
Bent



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No: 09/224,696  
Applicants: Cassandra L. Crotty et al.  
Filed: January 4, 1999  
Title: METHOD FOR VISUALIZING DATA  
TC/A.U.: 2672  
Examiner: Chante E. Harrison  
Confirmation No.: 3386  
Notice of Appeal Filed: July 14, 2003  
Docket No.: BU9-97-226

RECEIVED

SEP 16 2003

Technology Center 2600

**APPEAL BRIEF UNDER 37 C.F.R. § 1.192**

Mail Stop Appeal Brief-Patents  
Commissioner for Patents  
P. O. Box 1450  
Alexandria, VA 22313-1450

S I R :

The applicants hereby request consideration and reversal of the Final Rejection dated March 13, 2003, and the Advisory Action dated July 2, 2003, of claims 1, 2, 4-6, 8-10, 12-14, and 16-20.

This Brief is presented in the format required by 37 C.F.R. § 1.192, in order to facilitate review by the Board. In compliance with 37 C.F.R. § 1.192(a), this Brief is being filed in triplicate within two months from the date of the Notice of Appeal.

The fee for filing a Brief in support of an Appeal under 37 C.F.R. § 1.117(c) in the amount of \$320.00 is to be charged to Deposit Account No. 09-0456 (IBM Corporation).

**I. REAL PARTY IN INTEREST**

The real Party In Interest in this matter is International Business Machines Corporation by virtue of an assignment recorded on January 4, 1999, at Reel/Frame 9705/0232.

**II. RELATED APPEALS AND INTERFERENCES**

There are no other appeals or interferences related to the subject matter of this Appeal.

**III. STATUS OF CLAIMS**

Claims 1, 2, 4-6, 8-10, 12-14, and 16-20 are pending. Claims 1 (claims 4 and 17 depend from claim 1), 2, 5 (claims 8 and 18 depend from claim 5), 6, 9 (claims 12 and 19 depend from claim 9), 10, 13 (claims 16 and 20 depend from claim 13), and 14 are independent. Claims 3, 7, 11, and 15 have been cancelled. No claims have been allowed.

**IV. STATUS OF AMENDMENTS**

A Response to Final Office Action, mailed on April 30, 2003, has been entered, as noted in the Advisory Action of July 2, 2003. Accompanied by a second Technical Declaration of inventor Daria R. Dooling, the Response identified specific support in the specification for the claim phrase "mathematical matrix." The Advisory Action considered the Response and Declaration but deemed them insufficient to place the application in condition for allowance. A Table summarizing the entire prosecution history of the subject application follows, with bold highlighting the most relevant items.

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Paper No.	Title	Summary Technology Center 2600
4	1 <sup>st</sup> Office Action dated 12/21/00	1. Objection to drawing 2. Claims 1 & 2 rejected under § 112, 2d paragraph 3. Claims 1-16 rejected under § 103(a) over Golshani et al. (5,774,128) + Myers (5,581,677)
5	Response filed 4/21/01	1. Claims 1, 2, 3, 7, 11, and 15 amended
6	2 <sup>nd</sup> Office Action dated 6/5/01	1. Objection to drawing overcome 2. <b>Claims 1-3, 5-7, 9-11, and 13-15 rejected under § 102(e) over Schwuttke et al. (6,222,547)</b> 3. <b>Claims 4, 8, 12, and 16 rejected under § 103(a) over Schwuttke et al. (6,222,547)</b>
7	Interview Summary 6/18/01	1. Withdrew "Finality" of second Office Action
8	Response filed 8/1/01	1. Claims 3, 7, 11, and 15 amended ( <b>added "mathematical" before "matrix"</b> )
9	Final Office Action dated 8/28/01	1. Repeated same rejections from Office Action of 6/5/01
10	Response filed 10/12/01	1. Remarks only
11	Advisory Action Dated 11/5/01	1. Considered remarks but found them unpersuasive
	CPA filed 11/28/01	
	Preliminary Amendment filed 1/7/02	1. Remarks only
15	1 <sup>st</sup> Office Action dated 2/12/02	1. Repeated, as was done in Office Action of 8/28/01, same rejections from Office Action of 6/5/01 2. Remarks of 1/7/02 unpersuasive
16	Interview Summary of 3/15/02	1. Discussed were the features distinguishing the claimed invention from the Schwuttke et al. patent
17	Response to Interview Summary filed 3/22/02	1. The applicants submitted Remarks clarifying the Examiner's characterization of their interview
20	Response filed 6/12/02	1. Remarks and a first Technical Declaration of Dara R. Dooling under Rule 1.132 sought to distinguish the claimed invention from the Schwuttke et al. patent
21	Final Office Action dated 9/24/02	1. Repeated, for the 4 <sup>th</sup> time, the same rejections from Office Action of 6/5/01 2. Remarks and Declaration unpersuasive
22	Response filed 11/5/02	1. Remarks only
23	Advisory Action dated 11/26/02	1. Considered remarks but found them unpersuasive
24	Interview Summary of 12/9/02	1. Discussed were the features distinguishing the claimed invention from the Schwuttke et al. patent 2. <b>The Examiner stated: "Examiner notes that the distinguishing feature is the association of the data values with a mathematical matrix, from which the values are extracted to generate [a grid.] Representative also requests the Examiner's suggestion of claim amendments that would place the pending application in condition for allowance."</b>
25	Interview Summary of 12/16/02	1. <b>The Examiner and Supervisory Primary Examiner suggested revising the claims to replace each first limitation "with the following language: 'extractng [sic] a plurality of data values associated with a mathematical matrix to generate a grid based on a plurality of data values" which would "place the claims in condition for allowance."</b>

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Paper No.	Title	Summary Technology Center 2600
26	Response filed 12/23/02	<ol style="list-style-type: none"> <li>1. <b>Followed each of the suggestions made by the Examiner and SPE on 12/16/02</b></li> <li>2. Claims 3, 7, 11, and 15 cancelled</li> <li>3. Claims 1, 2, 4-6, 8-10, 12-14, and 16 amended</li> <li>4. Added dependent claims 17-20</li> </ol>
27	Advisory Action dated 1/29/03 [Later Withdrawn]	<ol style="list-style-type: none"> <li>1. Refused to enter Amendment of 12/23/02 as raising new issues and does not place application in condition for allowance</li> </ol>
28	(New) Final Office Action dated 3/13/03	<ol style="list-style-type: none"> <li>1. Withdrew "previous advisory and final rejection"</li> <li>2. <b>Objected to Amendment of 8/16/01 under Section 132 as introducing new matter: "mathematical matrix"</b></li> <li>3. Claims 1-3, 5-7, 9-11, and 13-15 rejected under § 102(e) over Schwuttke et al. (6,222,547)</li> <li>4. Claims 4, 8, 12, and 16 rejected under § 103(a) over Schwuttke et al. (6,222,547)</li> </ol>
29, 30	Response filed 4/30/03	<ol style="list-style-type: none"> <li>1. Remarks and second Technical Declaration of inventor Dooling</li> </ol>
31	Advisory Action dated 7/2/03	<ol style="list-style-type: none"> <li>1. Considered remarks and second Declaration but found them unpersuasive: "mathematical matrix" is not supported in the applicants' specification</li> </ol>
32	Notice of Appeal filed 7/14/03	

**V. SUMMARY OF INVENTION**

The present invention relates generally to using graphical computer systems to solve complex mathematical equations and, more specifically, to a method and system for visualizing data. Scientific visualization involves displaying large sets of data generated in the process of solving a scientific or engineering problem. In many engineering applications, large linear systems of equations arise. Such applications include, for example, simulation of nonlinear microwave circuits, robotic control, or power systems design. Linear systems of equations are typically expressed by the equation  $Ax = b$ , where the entries of the mathematical matrix  $A$  are data values that arise from the physical system involved and  $x$  and  $b$  are vectors.

Many numerical methods exist for the solution of systems of equations expressed in the form of this equation. Conventional software packages allow a user to store and display data arrays such as matrices. But these software packages typically cannot display a conductance matrix, for example, associated with the

operation of an electrical circuit with millions of components. The main difficulty with conventional packages is the limitation placed on allocation of memory provided for the storage of data arrays, thus limiting the ability of conventional packages to display large arrays. The present invention solves that difficulty.

The invention provides a method and a system for visualizing data arrays represented in the form of a plurality of data values. The plurality of data values are initially associated with a mathematical matrix, such as matrix A in the above equation, and these data values are extracted to generate a grid based on the plurality of data values. Each data value is then associated with a plurality of geometric shapes according to a predetermined set of rules. The geometric shapes associated with the data values are placed on the grid. Finally, the visual and geometric information placed on the grid are reported to a user in graphical form.

The user may then take advantage of the capability of a physical design software system to graphically display numerical data arrays. Numerical and structural properties of data arrays may be represented in a form that is recognized by a physical design system. The data array displayed, for example, in a printout makes it possible to visualize properties of a data array.

If a data array is sparse, for example, then by visualizing the data array it may be possible to observe certain patterns. Sparsity patterns may lead to the choice of suitable numerical methods, or reordering schemes with which to treat the data array. Sparsity patterns may also provide insight into the possibility of parallel processing of the data array. An integrated circuit visualization of the array may be used to determine circuit properties such as points of high current or points of low voltage. If the data values in the data array represent numerical data that is part of a larger computational process, then visualizing the data array may help to detect computationally intensive portions of the process.

Each of the sixteen pending claims recites the same first limitation, namely "**extracting a plurality of data values associated with a mathematical matrix to generate a grid based on the plurality of data values,**" that distinguishes the claimed invention from the applied reference. Of the sixteen claims, eight are independent. The eight independent claims can be viewed as two

sets of four claims each: (a) claims 1 (method), 5 (article of manufacture), 9 (computer program), and 13 (storage device readable by machine) each recite the subject matter illustrated in Fig. 1; and (b) claims 2 (method), 6 (article of manufacture), 10 (computer program), and 14 (storage device readable by machine) each recite the subject matter illustrated in Fig. 2.

## **VI. ISSUES**

(1) Is the phrase "mathematical matrix," recited in each of the pending claims as part of the limitation "extracting a plurality of data values associated with a mathematical matrix to generate a grid based on the plurality of data values," supported by the specification or does the phrase improperly introduce new matter as the Examiner determined?

(2) Does U.S. Patent No. 6,222,547 issued to Schwuttke et al. anticipate claims 1-3, 5-7, 9-11, and 13-15 under 35 U.S.C. § 102(e), as the Examiner determined?

(3) Would the invention recited in dependent claims 4, 8, 12, and 16 have been obvious to a person of ordinary skill in the art at the time of the invention, within the meaning of 35 U.S.C. § 103(a), as the Examiner determined, in view of U.S. Patent No. 6,222,547 issued to Schwuttke et al.?

## **VII. GROUPING OF CLAIMS**

Claims 1, 2, 4-6, 8-10, 12-14, and 16-20 are presented as standing together.

### VIII. ARGUMENT

The applicants discuss in turn each of the three issues, raised as questions above, as follows.

1. The Specification Supports  
The Claim Phrase "Mathematical Matrix"

In their Response mailed on August 1, 2001, the applicants first modified the claim term "matrix" with the adjective "mathematical." Specifically, the limitation "extracting a plurality of data values associated with a matrix" was amended to "extracting a plurality of data values associated with a mathematical matrix." Prosecution continued for another twenty months--including a number of Office Actions, Responses, Interviews, and the filing of a CPA--until the Final Office Action dated March 13, 2003 for the first time objected to the claim phrase "mathematical matrix" as improper for introducing new matter.

The undue delay of that objection and the impropriety of the PTO conducting an extensive substantive prosecution with both the applicants and the PTO focusing on the patentability of the specific claim limitation at issue are clear. What makes the impropriety more frustrating to the applicants is that, during an interview, both the Examiner and Supervisory Primary Examiner together suggested revising the claims to replace each first limitation "with the following language: 'extractng [sic] a plurality of data values associated with a mathematical matrix to generate a grid based on a plurality of data values" which would "place the claims in condition for allowance." Interview Summary of December 12, 2002. In their next Response, after the interview, the applicants followed precisely the suggestion, fully and reasonably expecting an allowance. The unexpected reply by the PTO, however, was the stated objection to the claim phrase "mathematical matrix" as improper for introducing new matter.

Perhaps even more troubling than the delay and waste of resources caused by the "new matter" objection is that the objection is objectively baseless. The general rule regarding new matter is stated in the concluding sentence of 35 U.S.C. § 132: "No amendment shall introduce new matter into the disclosure of the invention." Guidelines for applying that rule are found in 37 C.F.R. § 1.121(a)(6) and in MPEP §§ 608.04, 706.03(o). Specifically, prohibited "new matter" is information "involving a departure from or an addition to the original disclosure." Former Rule 118 (which was transferred "in condensed form" to new Rule 121, Dep't of Commerce, PTO, Changes to Patent Practice & Procedure, 62 Fed. Reg. 53132, 53152 (Oct. 10, 1997)). Amendments that merely clarify or make definite that which an originally filed application expressly or inherently disclosed do not violate the rule against new matter. *Schering Corp. v. Amgen Inc.*, 55 USPQ2d 1650, 1653-54 (Fed. Cir. 2000) ("The fundamental inquiry is whether the material added by amendment was inherently contained in the original application. . . . To make this judgment, this court has explained that the new matter prohibition is closely related to the adequate disclosure requirements of 35 U.S.C. § 112. . . . Thus, to avoid the new matter prohibition, an applicant must show its original application supports the amended matter."); see generally 4 D. Chisum, Chisum on Patents, § 11.04 (2002).

The applicants respectfully submit that the addition of the claim limitation "mathematical" does not constitute new matter for two reasons. First, the specification, as originally filed, supports that limitation expressly and, if not expressly, at least inherently. Second, the substitution of "mathematical matrix" for "matrix" is, in the context of the present invention, only the permissible substitution of reasonable equivalents. The limitation to a "mathematical" matrix represents subject matter inserted into the claims after the application was filed but which is nevertheless supported by the written description of the application as filed.

The applicants respectfully submit that the original disclosure is directed entirely to mathematical matrices, and, therefore "mathematical matrices" are disclosed to one skilled in the art, even through the word "mathematical" does not appear immediately before the word "matrix" in the specification. The specification expressly defines "matrices," in the context of the subject invention, as



tools used in mathematical analysis: "Matrices are useful constructs both in theoretical and applied mathematical analysis." Specification at page 12, lines 10-11 (emphasis added). The word "mathematical," when added to claims 3, 7, 11, and 15 in the Response dated August 1, 2001, characterized the "matrix" that was already specified by these claims.

The applicants expressly disclose three, specific mathematical matrices in the specification. In explaining Figure 1, which is a flow chart illustrating steps in a method for visualizing data arrays in accordance with an embodiment of the applicants' invention, the applicants refer to a graphical representation of a dense array shown as a mathematical matrix at page 8, line 3, and in Figure 4. Moreover, both of the examples provided by the applicants to explain their invention expressly incorporate mathematical matrices. See the applicants' specification at page 13, lines 7-11 (first example) and page 15, lines 8-12 (second example).

Submitted with the Response mailed on April 30, 2003 is a second Technical Declaration by Daria R. Dooling, an expert in the field of the present invention. Ms. Dooling's qualifications are set forth in a first Technical Declaration dated June 11, 2002 that was filed with a Response dated June 12, 2002. In the second Technical Declaration, Ms. Dooling (a) states that the original disclosure of the applicants' invention is all about mathematical matrices, (b) recites numerous quotations from the applicants' specification supporting her position, and (c) states that one skilled in the art readily recognizes that the description of the applicants' invention in the original disclosure describes "mathematical matrices." The limitation to a "mathematical" matrix represents subject matter which an artisan finds supported, inherently if not expressly, by the written description of the application as filed.

The applicants concede that the specification nowhere mentions the precise phrase "mathematical matrix." The law is clear, however, that amendments which do not directly affect the disclosure of the invention may be permissible even though they add phrases not found explicitly in the original application. *In re Wright*, 145 USPQ 182, 188 (CCPA 1965) (reversing Board's rejection based on new matter,

holding that the amendments "merely render explicit what had been implicitly disclosed originally, and, while new *language* has certainly been added, we are not prone to view all new 'language' ipso facto as 'new matter.'"). Such is the present case. Clearly, the limitation characterizing the matrix as "mathematical" is supported by the specification as filed.

Even if the specification did not expressly support that limitation, the claim amendment would not constitute new matter. The substitution of "mathematical matrix" for "matrix" is, in the context of the present invention, only the permissible substitution of reasonable equivalents. One of the dictionary definitions for "matrix" is: "*Math.* A rectangular array of algebraic or numerical quantities treated as an algebraic entity." Webster's II New College Dictionary at 675 (1986). The appeal decided in *Ex parte Heacock*, 134 USPQ 446 (Patent Office Bd. of Appeals 1962), provides both the legal principle governing and support for the substitution.

In Heacock, a reissue claim containing a broader expression encompassing equivalents available to the patentee when he filed the original application was allowed. (Like Section 132, 35 U.S.C. § 251 prohibits introduction of new matter; Section 251 specifically applies to a reissue application.) The original claim characterized a regulating device [matrix, here] as "an electron-discharge device" [unmodified, here]. The patentee amended the claim to include the broader expression "an electronic valve" [a narrower expression "mathematical matrix," here].

The Examiner rejected the amended claim, asserting "that the broader expression 'electronic valve' encompasses semi-conductor devices such as transistors and silicon control rectifiers, for example, all available to appellant when he filed his original application, and that such devices should have been positively disclosed therein if appellant contemplated their use in the system disclosed." Heacock at 447.

The Board of Appeals reversed the rejection, stating: "the substitution of semi-conductors and similar devices [mathematical matrix, here] for the regulator tube or electron discharge device [matrix, here] originally disclosed and claimed would involve only the substitution of reasonable equivalents." *Id.* Thus, the amendment was allowed and the reissue application granted. The present amendment is similarly proper.

2.     The Schwuttke et al. Patent Fails  
       To Anticipate Any of the Pending Claims

The Office Action rejected claims 1-3, 5-7, 9-11, and 13-15 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,222,547 issued to Schwuttke et al. Anticipation requires that each and every limitation of the claim be disclosed, either expressly or under principles of inherency, in a single prior art reference. *In re Robertson*, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999) (reversing Board's anticipation rejection that was based on principles of inherency); MPEP § 2131. Absence from the reference of any claimed limitation negates anticipation. *Rowe v. Dror*, 42 USPQ2d 1550, 1553 (Fed. Cir. 1997).

Schwuttke et al. disclose a method and apparatus for monitoring systems and, through a user interface, displaying the real-time data characteristic of the status of the systems in a three-dimensional, simulated, cyberspace representation. This display depicts the data in the form of graphic symbols or objects positioned within the three-dimensional virtual universe, allowing a human user to assimilate and comprehend large quantities of data rapidly. In essence, the method and apparatus present a visual abstraction of data. The data are described throughout the Schwuttke et al. patent as "telemetry data." The dictionary defines "telemetry" as "The science and technology of automatic data measurement and transmission, as by wire or radio, from remote sources, such as space vehicles, to a receiving station for recording and analysis." Webster's II New College Dictionary at 1134 (1986).

The present invention, as recited in each of the pending claims, contains at least one feature which is neither disclosed nor suggested by Schwuttke et al. Specifically, the very first limitation recited in each claim is "extracting a plurality of data values associated with a mathematical matrix to generate a grid based on the plurality of data values." (Emphasis added.) The highlighted limitation is described throughout the specification. See, e.g., page 11, lines 5-9, of the present application (considering the case of an integrated circuit layout, "numerical data values are obtained by extracting power buses and network resistance from the integrated circuit layout. The numerical data values thus obtained may then be organized in a data array such as a matrix."). Thus, the applicants' claimed invention is directed to a method and apparatus for solving complex mathematical equations which start by extracting data values associated with a mathematical matrix.

The Schwuttke et al. reference neither expressly nor under principles of inherency discloses the highlighted limitation. Rather than begin with extracting data values associated with a mathematical matrix, the method and apparatus of Schwuttke et al. start by monitoring telemetry data. The starting point of the Schwuttke et al. method and apparatus is completely different from the claimed starting point of the applicants' invention because the field of the Schwuttke et al. method and apparatus is completely different from the field of the applicants' claimed invention. Schwuttke et al. monitor and display telemetry data; in contrast, the applicants claim a method and apparatus for solving complex mathematical equations expressed in the form of a mathematical matrix. Accordingly, the applicants respectfully submit that the Schwuttke et al. reference does not anticipate any of the pending claims.

Nowhere do Schwuttke et al. teach extracting data from a mathematical matrix. Nor has the Examiner ever suggested otherwise. In fact, during the Interview on December 9, 2002, the Examiner and SPE agreed that this limitation distinguished the cited reference. The Examiner has simply negated the limitation as "new matter," then found the remainder of the claims (without this limitation) anticipated. Without addressing whether a claim lacking the

"mathematical matrix" limitation is patentable over the reference, because such is unnecessary for this appeal, the applicants point out that the Examiner's substantive patentability determination hinges on the "new matter" objection. Thus, if "mathematical matrix" is not new matter, then the pending claims are patentable.

Therefore, for the reasons set forth above, claims 1-3, 5-7, 9-11, and 13-15 are not subject to rejection under Section 102(e) as being unpatentable over the disclosure of Schwuttke et al. Because claims 4, 8, 12, and 16 depend from claims 1, 5, 9, and 13, respectively, these dependent claims are also patentably distinguishable from the cited reference.

3. The Schwuttke et al. Patent  
Would Not Have Rendered Obvious the  
Subject Matter Recited in Any of the Pending Claims

The Office Action rejected dependent claims 4, 8, 12, and 16 under 35 U.S.C. § 103(a) as being unpatentable over the '547 patent issued to Schwuttke et al. taken alone. In response to that rejection, the applicants point out that, because claims 4, 8, 12, and 16 depend from allowable claims, each of dependent claims 4, 8, 12, and 16 are also allowable. In further response, the applicants offer the following remarks establishing the nonobviousness of the claimed invention. In view of those remarks, the applicants submit that all of pending claims 1, 2, 4-6, 8-10, 12-14, and 16-20 are in condition for allowance.

The nonobvious differences between the invention recited in independent claims 1, 2, 5, 6, 9, 10, 13, and 14 (and, therefore, dependent claims 4, 8, 12, and 16) and the Schwuttke et al. reference have been discussed above. Schwuttke et al. do not disclose or suggest extracting a plurality of data values associated with a mathematical matrix to generate a grid based on the plurality of data values. The advantages of the subject matter of the pending claims are not attained or suggested by the cited reference. This is because the claims contain a feature (extracting a plurality of data values associated with a mathematical matrix to generate a grid based on the plurality of data values) not taught or suggested by that reference. As explained by Judge Rich in *In re Civitello*, 144 USPQ 10, 12 (CCPA 1964), when a claimed feature is not disclosed by the cited art, that art cannot render the claim obvious:

Since Haslachner fails to disclose the feature of the claim relied on, we do not agree with the patent office that it would suggest modifying the Craig bag to contain the feature. The Patent Office finds the suggestion, only after making a modification which is not suggested, as we see it, by anything other than appellant's own disclosure. This is hindsight reconstruction. It does not establish obviousness.

(Emphasis in original.) Thus, the applicants do not agree with the Examiner that the Schwuttke et al. reference supports a prima facie case of obviousness.

Dependent claims 4, 8, 12, and 16 further specify that the mathematical matrix is a "conductance" matrix, i.e., a conductance matrix "A" of an electronic circuit according to the mathematical formula  $Ax = b$ , where  $x$  is a voltage vector and  $b$  is a current vector. See, e.g., specification at page 1, lines 10-24. The Examiner acknowledged that Schwuttke et al. fail to disclose a conductance matrix. Final Office Action dated March 13, 2003, at page 6. Nevertheless, the Examiner rejected the four claims reciting that limitation on the ground that "it would have been obvious to one skilled in the art to use the teachings of Schwuttke because he graphically displays electrical data in a matrix (col. 7, ll. 23 et seq.; FIGS. 2 & 4; col. 6, ll. 8 et seq.)." Id.

The applicants respectfully disagree with the Examiner's assessment. First, the disclosure of graphically displaying data in a matrix differs significantly from the claimed limitation of extracting a plurality of data values associated with a mathematical conductance matrix to generate a grid based on the plurality of data values. Second, Schwuttke et al. illustrate their invention using one, particular example: monitoring telemetry data from a plurality of spacecraft missions. The telemetry data parameters incorporated in the invention disclosed by Schwuttke et al. are real-time communications, power, attitude control, propulsion, alarms, and SCT data obtained from the electrical, hydraulic, and mechanical subsystems of the spacecraft. There is neither mention nor suggestion of conductance data characteristic of an electronic circuit and represented in the form of a mathematical matrix in an equation.

4. Conclusion

For all of the foregoing reasons, the claim limitation "mathematical matrix" does not constitute new matter. Pending claims 1-3, 5-7, 9-11, and 13-15 are in condition for allowance and would not have been anticipated by the Schwuttke et al. reference. Because claims 4, 8, 12, and 16 each depend from a patentable claim, they are also patentable. See, e.g., *In re McCarn*, 101 USPQ 411, 413 (CCPA 1954) ("sound law" requires allowance of dependent claims when their antecedent claims are allowed). Moreover, claims 4, 8, 12, and 16 are nonobvious in view of the applied reference. The objection and the rejections under 35 U.S.C. §§ 102 and 103 should all be withdrawn. Favorable action is earnestly solicited.

Respectfully submitted,

  
\_\_\_\_\_  
Kevin R. Casey, Reg. No. 32,117  
Attorney for Applicants

KRC/kak

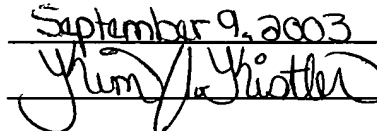
Attachment: Appendix

Dated: September 9, 2003

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The Commissioner for Patents is hereby authorized to charge payment to Deposit Account No. **09-0456 (IBM Corp.)** of any fees associated with this communication.

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Mail Stop Appeal Brief-Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on:

September 9, 2003  
  
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**APPENDIX**

The claims pending in this case upon filing the Notice of Appeal on July 14, 2003 are as follows:

**CLAIMS**

1. A method for visualizing data arrays provided in the form of a plurality of data values, said method comprising the steps of:

extracting a plurality of data values associated with a mathematical matrix to generate a grid based on the plurality of data values;

associating each data value of the plurality of data values with one of a plurality of geometric shapes according to a predetermined set of rules;

placing said one of the plurality of geometric shapes associated with each data value of the plurality of data values on the grid; and

displaying visual and geometric information placed on the grid to a user in graphical form.

2. A method for visualizing data arrays provided in the form of a plurality of data values, said method comprising the steps of:

extracting a plurality of data values associated with a mathematical matrix to generate a grid based on the plurality of data values;

identifying one of a plurality of numerical attributes associated with each data value of the plurality of data values;

associating each numerical attribute with one of a plurality of visual attributes;



associating each data value of the plurality of data values with one of a plurality of geometric shapes each having one of the plurality of visual attributes, which is consistent with the data value, according to a predetermined set of rules;

placing said one of the plurality of geometric shapes associated with each data value of the plurality of data values on the grid; and

displaying visual and geometric information placed on the grid to a user in graphical form.

3. (Cancelled)

4. The method according to claim 1, wherein the data arrays of the plurality of data values are the data arrays of conductance matrices.

5. An article of manufacture comprising a computer usable medium having computer readable program code means embodied therein for visualizing data arrays provided in the form of a plurality of data values, the computer readable program code means in said article of manufacture comprising computer readable program code means for causing a computer to effect:

extracting a plurality of data values associated with a mathematical matrix to generate a grid based on the plurality of data values;

associating each data value of the plurality of data values with one of a plurality of geometric shapes according to a predetermined set of rules;

placing said one of the plurality of geometric shapes associated with each data value of the plurality of data values on the grid; and

displaying visual and geometric information placed on the grid to a user in graphical form.

6. An article of manufacture comprising a computer usable medium having computer readable program code means embodied therein for visualizing data arrays provided in the form of a plurality of data values, the computer readable program code means in said article of manufacture comprising computer readable program code means for causing a computer to effect:

extracting a plurality of data values associated with a mathematical matrix to generate a grid based on the plurality of data values;

identifying one of a plurality of numerical attributes associated with each data value of the plurality of data values;

associating each numerical attribute with one of a plurality of visual attributes;

associating each data value of the plurality of data values with one of a plurality of geometric shapes each having one of the plurality of visual attributes, which is consistent with the data value, according to a predetermined set of rules;

placing said one of the plurality of geometric shapes associated with each data value of the plurality of data values on the grid; and

displaying visual and geometric information placed on the grid to a user in graphical form.

7. (Cancelled)

8. The article of manufacture according to claim 5, wherein the data arrays of the plurality of data values are the data arrays of conductance matrices.

9. A computer program product comprising a computer usable medium having computer readable program code means embodied therein for causing visualization of data arrays provided in the form of a plurality of data values, the computer readable program code means in said computer program product comprising computer readable program code means for causing a computer to effect:

extracting a plurality of data values associated with a mathematical matrix to generate a grid based on the plurality of data values;

associating each data value of the plurality of data values with one of a plurality of geometric shapes according to a predetermined set of rules;

placing said one of the plurality of geometric shapes associated with each data value of the plurality of data values on the grid; and

displaying visual and geometric information placed on the grid to a user in graphical form.

10. A computer program product comprising a computer usable medium having computer readable program code means embodied therein for causing visualization of data arrays provided in the form of a plurality of data values, the computer readable program code means in said computer program product comprising computer readable program code means for causing a computer to effect:

extracting a plurality of data values associated with a mathematical matrix to generate a grid based on the plurality of data values;

identifying one of a plurality of numerical attributes associated with each data value of the plurality of data values;

associating each numerical attribute with one of a plurality of visual attributes;

associating each data value of the plurality of data values with one of a plurality of geometric shapes each having one of the plurality of visual attributes, which is consistent with the data value, according to a predetermined set of rules;

placing said one of the plurality of geometric shapes associated with each data value of the plurality of data values on the grid; and

displaying visual and geometric information placed on the grid to a user in graphical form.

11. (Cancelled)

12. The product according to claim 9, wherein the data arrays of the plurality of data values are the data arrays of conductance matrices.

13. A storage device readable by machine, tangibly embodying a program of instructions executable by the machine to perform a method for visualizing data arrays provided in the form of a plurality of data values, said method comprising the steps of:

extracting a plurality of data values associated with a mathematical matrix to generate a grid based on the plurality of data values;

associating each data value of the plurality of data values with one of a plurality of geometric shapes according to a predetermined set of rules;

placing said one of the plurality of geometric shapes associated with each data value of the plurality of data values on the grid; and

displaying visual and geometric information placed on the grid to a user in graphical form.

14. A storage device readable by a machine, tangibly embodying a program of instructions executable by the machine to perform a method for visualizing data arrays provided in the form of a plurality of data values, said method comprising the steps of:

extracting a plurality of data values associated with a mathematical matrix to generate a grid based on the plurality of data values;

identifying one of a plurality of numerical attributes associated with each data value of the plurality of data values;

associating each numerical attribute with one of a plurality of visual attributes;

associating each data value of the plurality of data values with one of a plurality of geometric shapes each having one of the plurality of visual attributes, which is consistent with the data value, according to a predetermined set of rules;

placing said one of the plurality of geometric shapes associated with each data value of the plurality of data values on the grid; and

displaying visual and geometric information placed on the grid to a user in graphical form.

15. (Cancelled)

16. The device according to claim 13, wherein the data array of the plurality of data values are the data arrays of conductance matrices.

17. The method according to claim 1, wherein the data arrays of the plurality of data values are the data arrays of mathematical models of systems.

18. The article of manufacture according to claim 5, wherein the data arrays of the plurality of data values are the data arrays of mathematical models of systems.

19. The product according to claim 9, wherein the data arrays of the plurality of data values are the data arrays of mathematical models of systems.

20. The device according to claim 13, wherein the data array of the plurality of data values are the data arrays of mathematical models of systems.